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2861

In re Application of:

Docket No. 03560.002655

MASAHIKO KUBOTA ET AL.

Appln. No.: 09/676,092

Examiner: K. Feggins

Filed: October 2, 2000

Group Art Unit: 2861

For: LIQUID DISCHARGING HEAD, METHOD
FOR MANUFACTURING A LIQUID
DISCHARGING HEAD, AND LIQUID
DISCHARGING APPARATUS

August 28, 2002

THE COMMISSIONER FOR PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith is a response in the above-identified application.

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☒ No additional fee is required.

The fee has been calculated as shown below

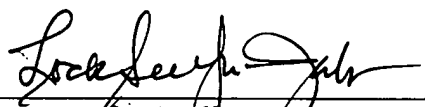
CLAIMS AS AMENDED						
	(2) CLAIMS REMAINING AFTER AMENDMENT		(4) HIGHEST NO. PREVIOUSLY PAID FOR	(5) PRESENT EXTRA	RATE	ADDITIONAL FEE
TOTAL CLAIMS	* 38	MINUS	** 38	= 0	x \$9 \$18	\$0
INDEP. CLAIMS	* 5	MINUS	*** 5	= 0	x \$42 \$84	\$0
Fee for Multiple Dependent claims \$140°/\$280						\$0
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT---						\$0

* If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 5.

- ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, write "20" in this space.
- *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, write "3" in this space.

- ☐ ?Verified Statement claiming small entity status is enclosed, if not filed previously.
- ☐ A check in the amount of \$____ is enclosed.
- ☐ Charge \$____ to Deposit Account No. 06-1205. A duplicate copy of this sheet is enclosed.
- ☒ Any prior general authorization to charge an issue fee under 37 C.F.R. 1.18 to Deposit Account No. 06-1205 is hereby revoked. The Patent and Trademark Office is hereby authorized to charge any additional fees under 37 C.F.R. 1.16 and 1.17 which may be required during the entire pendency of this application, or to credit any overpayment, to Deposit Account No. 06-1205.
- ☒ A check in the amount of \$400.00 to cover the Extension fee for response with a two-month extension is enclosed.
- ☐ A check in the amount of \$____ to cover the Information Disclosure Statement fee is enclosed.
- ☒ Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100 or by facsimile at (212) 218-2200. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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03560.002655

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

MASAHIKO KUBOTA ET AL.

Appln. No.: 09/676,092

Filed: October 2, 2000

For: LIQUID DISCHARGING HEAD, METHOD)
FOR MANUFACTURING A LIQUID)
DISCHARGING HEAD, AND LIQUID)
DISCHARGING APPARATUS)

Examiner: K. Feggins

Group Art Unit: 2861

August 28, 2002

The Commissioner for Patents
Washington, D.C. 20231

RESPONSE AND
PETITION FOR EXTENSION OF TIME

Sir:

Applicants petition to extend the time for response to the Office Action of March 28, 2002, to and including August 28, 2002. A check in the amount of \$400.00 for payment of the extension fee is enclosed. Please charge any additional fee and credit any overpayment to our Deposit Account 06-1205.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231 on

August 28, 2002

(Date of Deposit)

Lock See Yu-Jahnes

(Name of Attorney for Applicant)

Signature

August 28, 2002

Date of Signature

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#7
EOT ② + Response
DSmall's-Logan
9-18-02

This application has been reviewed in light of the Office Action dated March 28, 2002. Claims 1-18 are presented for examination. Claims 1, 8 and 14-16 are in independent form. Favorable reconsideration is requested.

Claims 1-18 were rejected under 35 U.S.C. § 103(a) as obvious from U.S. Patent 5,905,515 (*Yoshimura*) in view of U.S. Patent 6,074,040 (*Usui*). Applicants respectfully traverse these rejections.

Claim 1 is directed to a liquid discharging head comprising a pair of substrates connected in a laminated state, a plurality of liquid channels formed on a connected surface of one of the pair of substrates, a plurality of driving elements, each formed at a predetermined position above a corresponding one of the plurality of liquid channels, and orifices, each communicating with a distal end of a corresponding one of the plurality of liquid channels. A liquid is discharged from each of the orifices by an operation of a corresponding one of the plurality of driving elements. A face surface, serving as an outer surface of a member including the orifices, is coated with a material having an ultrahigh water-repellent property.

Claim 8 is directed to a liquid discharging head comprising discharging ports for discharging a liquid, liquid channels communicating with corresponding ones of the discharging ports, heating elements, each formed at a predetermined position above a corresponding one of the liquid channels, and a supply port for supplying the liquid channels with the liquid. The liquid within each of the liquid channels is boiled by a corresponding one of the heating elements to generate a bubble, and the liquid is discharged from a corresponding one of the discharging ports due to a pressure generated during the generation of the bubble. A face

surface, serving as an outer surface of a member for forming the discharging ports, is coated with a material having an ultrahigh water-repellent property.

Claim 14 is directed to a method for manufacturing a liquid discharging head.

The method comprises the steps of forming a plurality of driving elements on a surface of at least one of a pair of substrates, and forming a plurality of liquid channels so as to correspond to the plurality of driving elements. The method further comprises the steps of connecting the pair of substrates so as to provide a laminated state in which a surface where the plurality of liquid channels are formed is a connecting surface, and forming a member for forming orifices at a distal end of a connected substrate. The method further comprises the steps of coating a face surface, serving as an outer surface of the member, with a material having an ultrahigh water-repellent property, and causing the orifices to communicate with corresponding ones of the liquid channels.

Claim 15 is directed to a method for manufacturing a liquid discharging head.

The method comprises the steps of forming an element substrate made of silicon on a surface of at least one of a pair of substrates, forming a plurality of heating elements for generating thermal energy on the element substrate, and forming a plurality of liquid channels corresponding to the plurality of heating elements. The method further comprises the steps of connecting the pair of substrates so as to provide a laminated state in which a surface where the plurality of liquid channels are formed is a connecting surface, and forming a member for forming orifices at a distal end of a connected substrate. The method further comprises the steps of coating a face surface, serving as an outer surface of the member, with a material having an ultrahigh water-

repellent property, and causing the orifices to communicate with corresponding ones of the liquid channels.

Claim 16 is directed to a method for manufacturing a liquid discharging head. The method comprises the steps of forming heating elements for generating thermal energy on an element substrate made of silicon, forming liquid channels corresponding to the heating elements, forming a supply port for supplying the liquid channels with a liquid, and forming a member where discharging ports for discharging the liquid are formed. The method further comprises the steps of coating the member with a material having an ultrahigh water-repellent property, and forming the discharging ports in the coated member.

One feature of Claims 1 and 8 is that a face surface, serving as an outer surface of a member including the orifices, is coated with a material having an ultrahigh water-repellent property. One feature of Claims 14 and 15 is coating a face surface, serving as an outer surface of a member for forming orifices, with a material having an ultrahigh water-repellent property. One feature of Claim 16 is coating a member where discharge ports are formed, with a material having an ultrahigh water-repellent property.

Thus, each of the independent claims recites a material having an ultrahigh water-repellent property. Applicants note that an ultrahigh water-repellent property, or superhydrophobic property, is distinct from a mere water-repellent property, or hydrophobic property. While a discharge port plate having a hydrophobic property can basically keep liquid away from the discharge ports, a discharge port plate having a superhydrophobic property can also prevent liquid drops from sticking to the discharge port plate surface and can eliminate the need for cleaning the surface or remarkably decrease the frequency of such required cleaning. As a

result of the superhydrophobic surface, throughput is improved and a head can be produced which is highly reliable for a long period of time.

According to Applicants' understanding, *Yoshimura* relates to a water-repellent film for a nozzle plate of an ink ejecting device. Although *Yoshimura* mentions a water-repellent film including a fluorocarbon resin, this would provide only a hydrophobic property, not a superhydrophobic property. Applicants submit that nothing in *Yoshimura* would teach or suggest a material having an ultrahigh water-repellent property.

According to Applicants' understanding, *Usui* relates to an ink jet printer head, manufacturing method and ink, using gold and sulfur atoms to form a water-repellent thin film. *Usui* mentions contact angles of, for example, 60, 70, 90, 100 and 110 degrees. Such contact angles provide only a hydrophobic property, not a superhydrophobic property. Applicants submit that nothing in *Usui* would teach or suggest a material having an ultrahigh water-repellent property.

Since neither *Yoshimura* nor *Usui*, whether taken alone or in combination (even assuming, for the sake of argument, that such combination were permissible), contains all of the elements of any of the independent claims, those claims are believed patentable over the cited art.

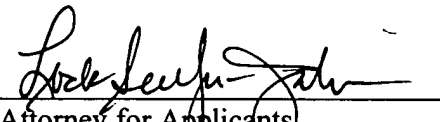
A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. These claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,


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